



Benthic habitats, and their living resources, comprise ~21% of our entire State!

- These habitats support many of the fishery and other resources that we depend on for both commercial and recreational uses.
- Our actions impact these habitats on a daily basis through fisheries management, industrial permitting, beach management, urban sprawl, dredging, excess nutrients, recreational usage, and climate change.

- We cannot effectively avoid or minimize our impacts if we don't know what needs to be protected.
- The current approach of using "best informed decisions" for management may be costing taxpayers and businesses millions of dollars every year.

Human interaction with Delaware Bay and benthic habitat cannot be avoided.

Industrial and non-point source pollution all contribute contaminants into the benthic setting. Because of these pollutants, the inhabitants of the benthic zone and the species which rely on it for food become stressed and lower the benthic habitat's ability to sustain life. The deterioration of this habitat can cause an overall reduction in the populations and biodiversity of all species within Delaware Bay. Every aspect of life in the bay is interconnected together in a large web. If one area or species becomes stressed, then that condition will affect many other species that depend on them for food.

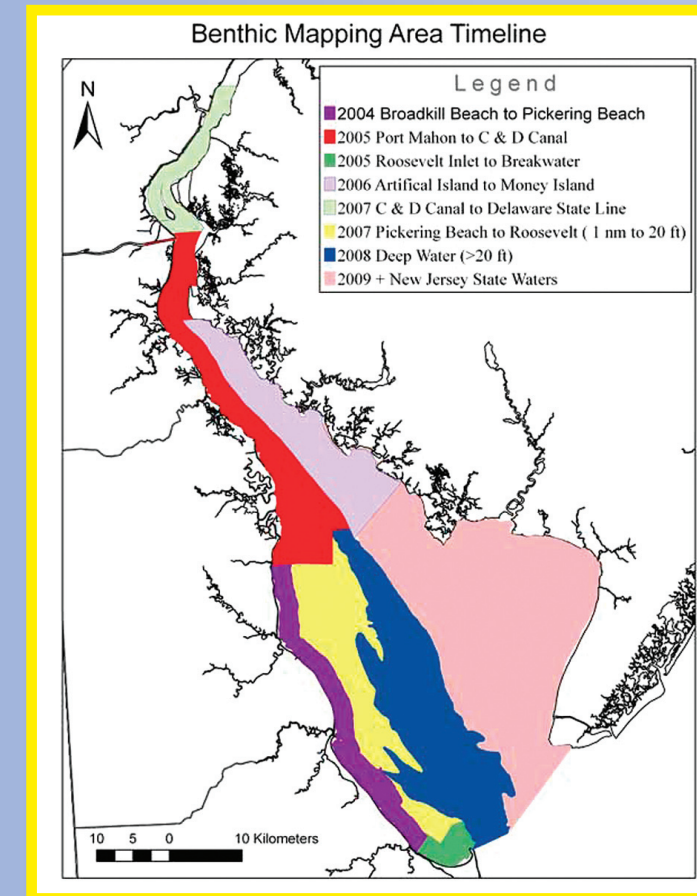


All of us who live in the Delaware Bay and River watershed should be conscious of our actions and how they might affect the benthic habitat in Delaware waters.



What are we doing to better understand the benthic habitat in the Delaware Bay?

The Delaware Coastal Programs group of DNREC's Division of Soil and Water Conservation is working closely with several universities, state and federal agencies, and nonprofit organizations to carry out a bottom and sub-bottom imaging project to identify and map the benthic habitat and sub-bottom sediments of Delaware Bay and River. This collaborative project was initiated to better understand the distribution of bottom sediment types, habitat, biodiversity, and – most importantly – the impact of human activity upon the Bay bottom and its living resources.



The Delaware Bay Benthic Mapping Project (DBBMP) will help to unlock many of the secrets of the Bay's most important biological resources and habitat affinities. The project will achieve this by mapping a total of 120 square miles of oyster habitat in Delaware waters, sturgeon habitat in the Delaware River, horseshoe crab habitat along the Delaware shelf between Pickering Beach and Breakwater Harbor, and characterize the benthic habitat for many other important species.



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We know far more

about the surface of

Mars than we know

about the benthic habitats and

living resources of Delaware's

ocean, bays, and river bottoms.



What is a benthic habitat?

The term *benthic* refers to anything associated with or occurring on the bottom of a body of water. The animals and plants that live on or in the bottom are known as the benthos. Benthic habitats can best be defined as bottom environments with distinct physical, geochemical, and biological characteristics. Benthic habitats vary widely depending on their location and depth, and they are often characterized by dominant structural features and biological communities.

The Delaware Bay is dominated by estuarine and nearshore benthic habitats that are highly diverse in their physical characteristics. They include shallow submerged mudflats, rippled sandflats, rocky hard-bottom habitats, silty and sandy shoals, shellfish beds, and tube worm reefs.



Why is it important?

There are several reasons. Estuarine and nearshore benthic habitats support a wide diversity of marine life by providing spawning, nursery, refuge, and foraging grounds for fish species. They function in nutrient cycling, and contribute to the removal of contaminants from the water column. Benthic organisms are also important members of the lower food web, consuming organic matter and phytoplankton and serving as food sources for higher level consumers.

- Many benthic habitats (for example, tube worm reefs, oyster reefs, artificial reefs, and gravel bars) have three-dimensional structures that serve as shelter and provide storm protection by buffering wave action along coastlines. They also provide a complex environment for smaller creatures



- (such as worms, barnacles, bivalves, algae, crabs, amphipods, and shrimp) to hide in and/or attach to—and these areas may serve as valuable feeding habitats for many larger species.
- Benthic habitats can play an important role in maintaining water quality. Many benthic organisms—including filter feeders such as oysters, hard clams, bay scallops, and mussels—obtain their food by taking in sea water. As the water flows through their bodies, sediments, organic matter, and pollutants are filtered out and ingested. Therefore, benthic communities are good indicators of health in estuarine ecosystems.
 - Benthic habitats play a critical role in the breakdown of organic matter, through the actions of scavengers, deposit-feeders, and bacteria.
 - Many benthic organisms—such as amphipods, worms, and plants like widgeon grass—serve as important food sources for many species of fish, shellfish, and birds.

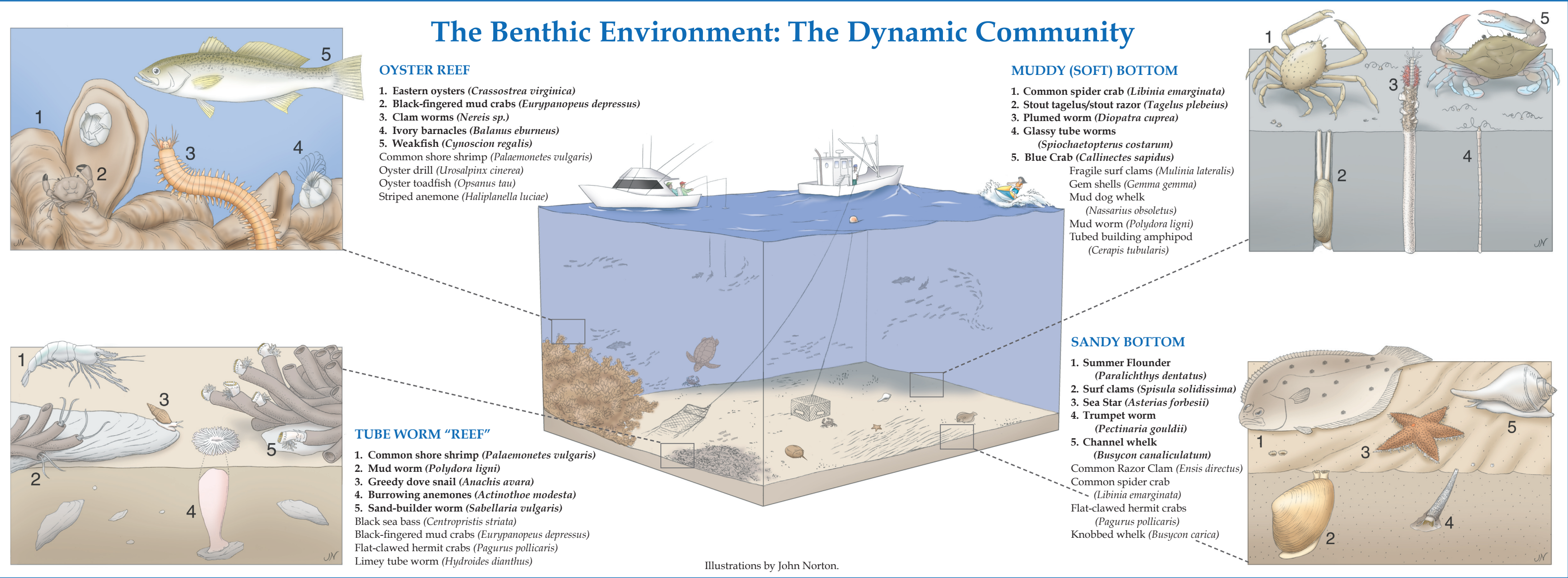
How do YOU IMPACT Delaware Bay and its benthic habitat? Why should YOU CARE?

Do you eat oysters, blue crabs, or hard clams? These commercially fished species depend on specific habitat and thrive under healthy conditions in the benthic environment. The excessive use of commercial fisheries dredges can harm the benthic habitat by disturbing the bottom and killing organisms that are not intended for harvest (also called bycatch).

Do you have a septic system? Do you fertilize your lawn? Leaks in septic systems and over fertilization of your lawn contribute to nonpoint source pollution to the bay and river.

Do you participate in recreational fishing? Flounder, weakfish, and striped bass all depend on specific habitats for their survival, and their recent status is attributed to current ecological conditions within the bay and along the benthic setting.

Do you wind surf or use a motor boat, canoe, kayak, water ski, or jet ski? These types of recreation have the potential for humans to interact with the life within the bay. Boat wakes, anchors, boat engines, and vessel bottoms all have the potential to lessen the quality of the benthic habitat and directly harm the bay inhabitants by disturbing the natural setting on which they depend.



What creatures live in benthic habitat? Where?

- INFAUNA**—Plants, animals and bacteria of any size that live in the sediment.
- EPIFAUNA**—Plants, animals and bacteria that are attached to the hard bottom or substrate (for example, to rocks or debris); are capable of movement; or that live on the sediment surface.

- DEMERSAL**—Bottom-feeding or bottom-dwelling fish that feed on the benthic infauna and epifauna.
- Bottom-feeding or dwelling fish that feed on the benthic community include some of the most economically valuable fish in the Delaware Bay.

- Soft-bottom (muddy bottom) fish include flounders, puffers, searobins and cownose rays.
- Hard-bottom fish include those found near tube worm and oyster reefs, such as the oyster toadfish, weakfish, and the goby.

- Bottom-feeding juvenile and adult finfish—such as spot, croaker, striped bass, and white perch—rely on the polychaete worms and crustaceans, which live in the benthic habitat, for food.